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Grinnell

THE GRINNELL

SENSITIVE

AUTOMATIC SPRINKLER

AND

FIRE ALARM. 8-11-84.

AN EXPLANATION

OF THE

Object and Method of Operation of the Automatic Sprinkler,

AND

STATEMENTS OF ACTUAL CASES WHERE IT HAS ARRESTED FIRES.

MANUFACTURED BY THE

PROVIDENCE STEAM & GAS PIPE COMPANY,

PROVIDENCE, R. I.

C. L. HORACK, C. E., GENERAL AGENT

For Middle and Southern States.

NEW YORK OFFICE,

BENNETT BUILDING, 93 NASSAU STREET.

Philadelphia Office and Branch Workshop,

917 SANSOM STREET.

C A R D .

Twenty years' experience in equipping factories with steam heating and fire-extinguishing apparatus, enables us to do this class of work in the most improved and acceptable manner.

During this time we have, as we may fairly claim, been largely instrumental in bringing this class of work, in all its numerous details, from comparative crudeness of design and workmanship up to its present advanced state of efficiency.

We have seen many short-lived, and sometimes worse than useless, devices foisted upon the public under the name of improvements; but it has always been our aim and practice to recommend and execute only such work as educated judgment and long experience have clearly shown us to be safest, and at the same time most economical (in the truest sense of that word) for our patrons. By a steady adherence to this course, we have secured the confidence and patronage of the public; and it will be our constant endeavor to retain these valued favors by a continuance of that policy.

PROVIDENCE STEAM & GAS PIPE CO.

FREDERICK GRINNELL, PRESIDENT,

J. C. HARTSHORN, TREASURER,

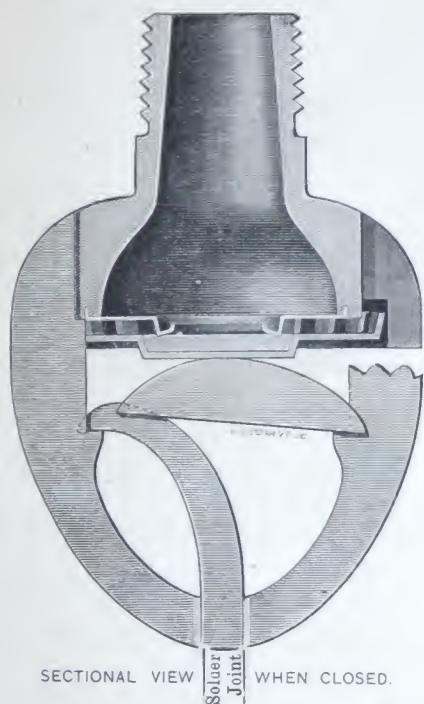
F. H. MAYNARD, SECRETARY.

Providence, May 18, 1882.

THE GRINNELL SENSITIVE AUTOMATIC SPRINKLER

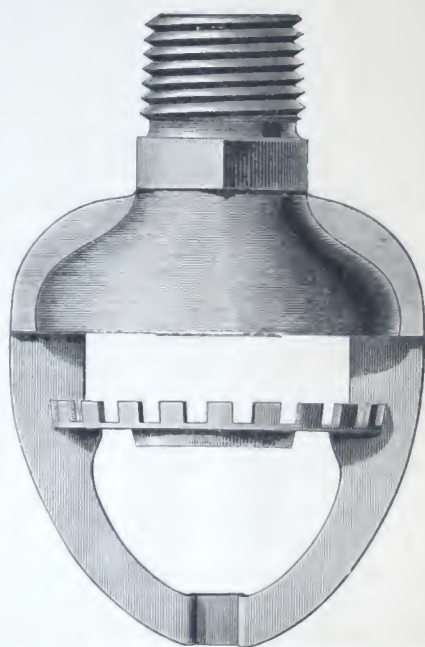
AND

FIRE-ALARM.



SECTIONAL VIEW WHEN CLOSED.

ACTUAL SIZE.



SIDE VIEW WHEN OPENED.

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PURPOSE AND DESCRIPTION

OF THE

Grinnell Automatic Sprinkler.

The special purpose of this Fire Extinguisher — or Sprinkler, as it is more commonly known in its application to factories — is to arrest a fire in its very incipency through the agency of the heat of the fire itself. It is thus perfectly automatic, in that it requires no human intelligence or agency to operate it. No arguments are needed to demonstrate the superiority of this summary method of dealing with fires; it is self-evident. Arguments may properly be reserved for the question of the practicability of the devices constructed to accomplish the purpose.

General Arrangement of the System.

Lines of small pipes are carried through the building, near the ceilings, and from eight to ten feet apart; and these are all connected with a larger pipe leading from the public water main, a tank in the tower, or any source of supply that will keep the water in the pipes under pressure. To each of the suspended lines of pipe, and ten to twelve feet apart, the automatic sprinklers hereafter described are attached. Each sprinkler, therefore, covers and protects about one hundred square feet of surface, both of floor and ceiling. The sprinklers being not over eight to twelve feet apart, a fire cannot occur more than seven feet from four of them, and may be within four feet of two of them. Should a fire start at any point, the heat at once rises to the ceiling, where the temperature is very soon raised sufficiently to melt the fusible solder which secures the valve of the automatic sprinkler; the valve is then released, and the water, which is under pressure in the pipes, is profusely distributed on the fire, in a manner more particularly explained hereafter. The arrangement of the piping can be readily modified to suit buildings of different plans of construction.

Reliability of the Solder to Operate the Sprinklers.

After many fruitless efforts in various directions to accomplish this end, it is now generally conceded that a metal, or solder, that will fuse at a low temperature, say 155° Fahr., is the only substance which, owing to its strength as a metal when cold, can be relied on to hold a previously locked device; and that is also so certain of destruction by heated air, that it can be equally relied upon, when so exposed, to liberate the same device, and thus set free a shower of water upon the fire. There are various devices, having cords, thread, and even *gunpowder*, as first recipients of the heat; but they are all radically defective in this respect at least, — that they require a *flame* to ignite them, while low-fusing metal will melt in heated *air*. It should be remembered, however, that while 155° Fahr. is the melting-point of the solder, it will require a much higher temperature to melt it within a reasonable time. It may be interesting to note that a shaving of this solder, which becomes liquid almost instantaneously upon being immersed in *water* at a temperature of 155°, will require twenty minutes' exposure to heated air at 175° before it will fuse. This is due to the fact that a given volume of water, at a given temperature, contains more than 3,000 times as much heat as the same volume of air at the same temperature.

As the success of any such device for automatically extinguishing fires must depend upon the promptness with which the fusible metal yields to the heated air, it will, therefore, readily be seen how important it is that every feature in the construction of such a device shall, if possible, be avoided which in any way tends to counteract or retard the full effect of the heat, even in its earliest stages. This characteristic is completely secured by the peculiar but simple construction of the Grinnell Sensitive Sprinkler, in which only thin pieces of metal are employed; and being fully exposed to the heated air, and not at all to the chilling effects of the water in the pipe, the fusion will occur, and the sprinkler be released, much sooner than in any device heretofore known.

Comparative Merits of Valve-Sprinklers and Water-Joint Sprinklers.

Broadly speaking, there are two types of automatic sprinklers in use. In one type the water is held back (until the emergency of a fire requires that it be liberated), by means of a fusible solder-joint, and is known as the Water-Joint Sprinkler. Of this type are the Parmelee, with the cap or seal either over or inside of the rose-head, or distributor, and the so-called Burritt, which is an imitation of the latter. In these the water held in the pipes comes in contact with the fusible solder, and to operate them the mass of metal holding the water, as well as the water itself, which is in contact with the solder, must be heated to the melting temperature of the solder.

The other type of sprinkler restrains the water by means of a valve; whence the name. Of this type is the Grinnell. It has been well understood that a sprinkler constructed with a valve to hold the water, secured by solder placed *away from the water*, and from the mass of metal which contains the water, would be far more sensitive to heat, and therefore a more effective and reliable sprinkler. The cap or plug sprinkler, with the solder forming the *water-joint*, was in fact resorted to as a necessity rather than chosen for its merits.

Nearly twenty years ago devices embodying a valve were made, and it is no doubt a fact that all who have tried to invent an automatic sprinkler have worked in that direction, and all without success.

Seemingly such a sprinkler is a very simple thing to make; but it is a fact that it imperatively demands a valve which (1) *is held closed by the water pressure, and yet forced open by the same pressure* when the device which holds it is released by heat; and, further, (2) *the valve must move before it opens*. With regard to the first requirement, it may be said that it has hitherto been found extremely difficult to make a valve tight under practical conditions, although most ingenious devices have been employed to overcome the inevitable tendency to leak. This serious defect in valve sprinklers now seeking recognition is practically admitted by resorting to the plan of keeping the water shut off from the leaky sprinklers, and the employment of complex and unreliable mechanism to turn it on when needed.

Of the two essential features above referred to the *first* is necessary for *absolute tightness under all conditions of pressure or water-hammer*, and the *second* is necessary to *completely rupture the solder-joint before any water can escape to cool the solder, when by yielding it has allowed a slight movement of the valve*.

These paradoxical conditions are completely obtained in the Grinnell device, as will be seen from the following description:—

Description of the Sprinkler.

One of the cuts on the inner title-page represents the sprinkler closed water-tight; the other represents it open for the discharge of water.

A thin metallic *diaphragm*, capable of yielding to the internal water pressure, forms the bottom side of the sprinkler body. In the centre of this diaphragm is an opening about one-half an inch in diameter, through which the water is discharged. Around this opening is a raised ring or *valve-seat*, formed on the diaphragm. The *valve proper*, or cover which closes this opening, is a disc of soft metal, which is held in a circular brass plate, about $1\frac{3}{4}$ inches in diameter. This brass plate has a toothed edge, and is a *deflector*, or means by which the stream of water issuing from the opening is cut into spray and distributed on both ceiling and floor. The soft metal disc, or valve proper, is held against the seat ring on the diaphragm by a pair of *compound levers*, one of which bears centrally on the deflector which holds the disc. Both of these levers fulcrum on a thin brass yoke $\frac{1}{8}$ of an inch thick,

which is secured to the body of the sprinkler, and the long arm of the second lever is secured to the yoke by the fusible solder.

When the sprinkler is thus closed, the pressure of the water on the yielding diaphragm forces the seat ring against the soft metal disc or valve. The greater the water pressure the closer will be the contact between the seat and the valve, and hence, when once the outlet is closed tight, it can never leak.

Operation of the Sprinkler.

When the heat of a fire softens the solder joint between the second lever and the yoke, the diaphragm, with its valve-seat and the valve, *move together* a sufficient distance to completely sever the solder joint before any water can escape to cool it. The levers are thrown from the yoke; the deflector, with the valve, is forced from the opening to the notches which formed the fulcrums that held the levers, and the deflector is then in position to distribute the escaping water, as shown in one of the cuts.

It will thus be seen that this device does embody a valve which is *held closed and is forced open by the same pressure, and that it moves before it opens.*

Sensitiveness to Heat.

There is no question as to how soon after a fire starts *it ought to be put out*, and it is certain that the damage likely to be done increases in a very rapid ratio in proportion to the time it burns. Careful experiments show that it requires, under varying conditions, only *one-tenth to one-fifteenth the quantity of heat*, as measured by *time and temperature*, to operate the Grinnell Sensitive Sprinkler that it does to operate a *water-joint* sprinkler.

The most sensitive sprinkler possible is of course one that will discharge the water as soon as a shaving of the solder would melt if placed beside it. The Grinnell Sprinkler practically does this; it will operate, for instance, in a gradually increasing temperature in ten or fifteen seconds after a sufficient heat has been reached to soften a shaving of solder; whereas the Parmelee, so-called Burritt, or any other *water-joint* sprinkler, will require from four to five minutes longer time in a temperature which during the time has increased to upwards of 500° Fahr., and a still longer time if the temperature rises more slowly.

The above figures show very forcibly the advantage of the sensitive sprinkler, not only to apply water more quickly at the point where the fire starts, but to overreach and cut off a fire which is spreading rapidly in a small quantity of light material.

The greater the quantity of combustible material in which a fire starts, and the smaller the room, the quicker any sprinkler will work. The larger the room and the lighter the distribution of combustible material, the *slower* the *temperature* will rise, and the difference in time between the working of the Grinnell Sensitive and *water-joint* sprinklers will increase in a rapid ratio.

We are prepared to show by tests in our test building that persons without inconvenience can walk around a fire that has caused *all* of the Grinnell Sprinklers in the building to operate (the water being shut off), and that with any other sprinkler it is impossible to stay even inside the door one-half the time that it takes to operate the *first one* immediately over the fire.

No one, after witnessing such a test, would think of spending money for pipe, fittings, and labor, and then attaching a slow-working sprinkler, which of necessity is sold cheap.

The fire tests which have been made with *water-joint* sprinklers in our building in Providence, and other places, and especially those made by the Boston Manufacturers Mutual Insurance Co. in a building in Chelsea, in June, 1881, accounts of which have been so extensively published, were instructive in showing that such sprinklers would work with a *rapidly burning fire* and *intense heat* before the roof of the building could be set on fire. In all of these tests, however, the sprinklers were made to work very quickly, say in from one to two minutes; whereas, under the usual conditions of fire, the temperature would rise much more slowly, and a correspondingly wide difference obtain in the time of working of the *sensitive* and *water-joint* sprinklers than would appear in such tests.

In dry-rooms and in picker-rooms the Parmelee Sprinkler has worked very successfully, yet it is certain that the Grinnell Sprinkler would have done better; and that in larger rooms, used for spinning and carding, its efficiency will prove to be very much greater.

Water Distribution.

In the matter of water distribution the risk of stopping up or clogging with sediment in the water, which is sure to happen to a greater or less extent with *all other* sprinklers, is in this device removed, since the water is discharged from a half-inch hole, instead of from fine slots or perforations, and distributed by means of the toothed-edged deflector.

System of Piping.

The sprinklers heretofore used with the solder forming the *water joint* had to be placed at the ends of arms extending from lateral lines of pipe, to prevent the cooling effect on the solder of a current of water in the pipes. To carry out this arrangement it has been necessary to place the entire system of piping and the sprinklers below the bottom side of the main beams, where they are in the way of the shafting, hangers, and belts.

The solder joint of the Grinnell Sprinkler cannot be cooled by the water in the pipes; hence they can be placed in a continuous line of pipe instead of at the ends of arms. The system, therefore, consists of one main line of pipe, running lengthwise at the side of the room, with branches extending across the room in each bay, *close up under the ceiling plank*, centrally between the beams. The sprinklers are attached directly to these branch

lines at proper intervals, and the entire system is therefore out of the way of all shafting, hangers, pulleys, and belts.

This feature, properly understood, would alone give this sprinkler preference over all others, especially as it removes the danger of accidental water damage, occasioned by a broken belt tearing down the pipes, of which there have been several instances.

A Perfectly Reliable Fire-Alarm.

Until we have devised an "automatic cut-off" which shall stop the flow of water as soon as the fire is extinguished, we must be content with an alarm gong, or whistle, operating simultaneously with the sprinklers, to call attention to the fact that a fire has started somewhere in the building. The water can then be shut off as soon as the fire is out. This is a most important adjunct to the sprinkler. We construct a perfectly reliable device for this purpose. It consists of a check-valve placed in the main supply-pipe to the sprinklers, which valve is at once opened by the current of water flowing through the pipe when a sprinkler is in operation, or if a leak should develop in the pipe. This movement of the valve is communicated to a mechanism which operates the gong or whistle.

To Avoid Frozen Pipes.

The complete success of an automatic sprinkler in the prompt discharge of water right at the point of occurrence of a fire depends of course upon an *ever ready water supply*. Generally the water is kept under pressure day and night in the pipes that are to supply the sprinklers whenever the emergency arises; but there are localities where severe cold weather will freeze the water in the pipes, and render them useless. In such cases it is necessary, during the cold season, to empty the pipes. With no device for letting on the water automatically, should a fire occur, the efficiency of the sprinkler would depend largely upon the promptness with which the water was turned into the pipes. The special danger in this respect would be incurred at night or on Sunday, when the fire might not be discovered at the critical moment even by a watchman on duty. There is, however, a clear advantage with the sprinkler, even though the fire should have made some headway before the water was turned into the pipes; for however dense the smoke in the room, and however difficult, therefore, for a watchman or fireman to locate and reach the point of greatest danger, the turned-on water will, so to speak, search out the fire and expend its force just where it is needed, and there only; for it is only where the heat of the fire has melted the solder and opened the sprinklers that the water will be thrown.

But in order to make the system completely automatic, even when the water is shut off from the distributing pipes to prevent freezing, we have perfected a mechanism that automatically lets the water into the pipes the moment *any one* of the sprinklers is released by the heat.

SUMMARY OF THE
Advantages of the Grinnell Automatic Sprinkler.

First. It is always in readiness to act, at whatever hour of the day or night a fire may occur.

Second. It is not dependent for its efficiency upon the intelligence, faithfulness, coolness, or even the presence of the watchman or other attendants. It is absolutely automatic in its action.

Third. It is prompt to act because of its extreme sensitiveness to the heat.

Fourth. It can be relied upon to do efficient work in a room so charged with stifling smoke that no human being could remain there.

Fifth. It will confine the fire within a few feet of the spot where it originated.

Sixth. It will discharge water only in the immediate vicinity of the fire which operates it, and therefore all unnecessary damage by water is avoided.

Seventh. Having an open outlet, its efficiency can never be destroyed or impaired by becoming clogged with lead, rust, or other substances, as is liable to occur with all devices discharging through slots or rose-heads.

Eighth. If a fire starts and is not discovered, it not only promptly attacks the exact point of danger, but gives the alarm to the watchman, who will then be in readiness to shut off the water as soon as the fire is extinguished.

Ninth. In severe winter weather, when it may be necessary to shut off the water from the pipes to avoid freezing, if a fire starts, this apparatus will turn the water into the pipes again by the same movement which opens any one of the sprinklers for use.

FACTS AND ARGUMENTS.

LOSSES BY FIRE.

About one hundred and fifty million dollars' worth of property are annually destroyed by fire in this country, while many millions more are lost by the enforced idleness of capital, and thousands of days are wasted by operatives and others thrown out of employment.

From this we might go on and treat this question in a comprehensive manner, from the view point of the political economist; but such is not our purpose. Our object is to show the *individual* property-owner that we can be of service to him and save him money.

PROTECTION FOR MANUFACTURING PROPERTY.

Thirty years' experience in the cotton and woolen mills of New England has demonstrated beyond question the value of such fire apparatus as has from time to time been devised. Until recently the study has chiefly been to provide apparatus which can be used with promptness and effect by comparatively unskilled persons to *put out the spark*, rather than powerful apparatus to control a *destructive fire*, or, it may be, wet down the ruins, the inevitable result of *delay*. Before the Factory Mutual Insurance system was inaugurated and means for protection introduced into these factories, the stock insurance companies charged from two to three per cent. per annum to insure them. At the present time there is no difficulty in placing such portion of this insurance as the mutual companies cannot take, in the best stock companies at one per cent. or less; while on the mutual plan the cost of insuring this hazardous class of property has been but about one-third of one per cent. per annum, including fire losses and all expenses of conducting the business; and it is a fact that this result is largely due to the use of well-designed fire apparatus by the operatives.

It has, therefore, undoubtedly, paid the owners of this vast property to spend money for fire-extinguishing apparatus. Still, for the

FURTHER REDUCTION OF FIRE LOSSES,

something better was required, because —

First. Any apparatus which needs care and attention that it may *surely* be in order when it is needed, — one that requires familiarity with a system of pipes and valves, and the coolness, courage, and experience of first-class firemen to use it, — is of uncertain value in the hands of the owner and average employé.

Second. The records of mutual insurance companies show that while more than three-fourths of all the fires in mills occur in the daytime, when the mills are running, and the operatives present to work the apparatus, *more than three-quarters of the total loss* by fire has been caused by the fires which have started *in the night*, or on Sunday, *when the operatives were not present*.

- Evidently, then, an apparatus which can prevent this *large proportionate loss*, from the comparatively *small number of fires* which start *when no one is present*, is the thing required.

THE AUTOMATIC SPRINKLER SYSTEM,

which is now fully superseding the *sprinkling pipes*, exactly meets this requirement. No care is necessary to keep it in order, nor hands and brains to use it when needed. In an analysis of the causes of fires, Mr. Edward Atkinson, President of the Boston Manufacturers Mutual Fire Insurance Company, in his Special Report No. 10, after finding the above facts, says: "A more potent argument in favor of well-drilled fire departments by day, and of Automatic Sprinklers, to protect property by night, could not well be presented." (See List of fires extinguished, p. 17.)

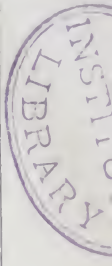
INSURANCE.

The introduction of the Automatic Sprinklers into the factories which are insured in the New England Factory Mutual Insurance Companies was not urged by the officers of those companies, until, at their request, it had been carefully investigated by a committee appointed by the New England Cotton Manufacturers Association, all of whom were policy-holders in the mutual companies.

Frederick Grinnell, president of our company, was invited to read a paper upon the general subject of "Fire Apparatus for Factories," at the April meeting, in 1878, of the New England Cotton Manufacturers Association. This paper was ordered printed in their semi-annual report, and a committee appointed to fully investigate the merits of the Automatic Sprinkler.

Since that time the repeated operation of the Automatic Sprinklers in cases of actual accidental fires (see List of fires extinguished, p. 17), and the disappointment experienced in the use of perforated pipe sprinklers, have so fully demonstrated their superiority, that they are now required by the mutual companies in all newly fitted mills. Many of the largest policy-holders are now replacing well-arranged systems of iron-pipe-sprinklers with the automatic, for the greater safety of their property and business, *irrespective of the question of insurance*.

During the last four years we have fitted up a large number of leading manufacturing establishments, at a cost of from one to five thousand dollars or more, to make them suitable risks for the New England Factory Mutual Insurance Companies, and which were previously



insured in stock insurance companies. The pecuniary result has been that the saving in insurance pays the entire outlay in from one to three years, even at the present extremely low rate of stock insurance. This, taken in connection with the rigid periodical inspection which the property receives from these companies, and the unquestioned quality of the insurance, certainly pays; and any manufacturer who refuses to investigate this matter, and obtain this insurance if he can, is fearfully blind to his own interest.

We select the following well-known first-class concerns, purposely outside of New England, who have availed themselves of the advantages of the Mutual Insurance system:—

D. M. OSBORN & Co., Auburn, N.Y.

H. R. WORTHINGTON Hydraulic Works, Brooklyn, N.Y.

NEW YORK BAGGING COMPANY, Brooklyn, N.Y.

INDIA RUBBER COMB COMPANY, College Point, N.Y.

W. A. WOOD, Reaper & Mower Machine Company, Hoosick Falls, N.Y.

LUDLOW VALVE MANUFACTURING COMPANY, Lansington, N.Y.

DOMESTIC SEWING MACHINE COMPANY, Newark, N.J.

DANFORTH LOCOMOTIVE & MACHINE COMPANY, Paterson, N.J.

THOMAS DOLAN & Co., Philadelphia, Pa.

WILLIAM SELLERS & Co., Philadelphia, Pa.

and 120 others.

EXTRA HAZARDOUS RISKS.

In reference to manufacturing property that cannot be insured in the mutual companies, owing to the nature of the business, the construction of the buildings, or outside exposure, we will say that stock insurance companies, previous to the introduction of the Automatic Sprinkler, have made reductions for other appliances far in excess of their value in preventing loss. The present ruinously low rate at which property is being insured by the stock companies is not favorable to a specified reduction of premiums; still, leading underwriters now acknowledge the exceptional value of the Automatic Sprinkler, and the New York Board of Underwriters have recommended a reduction on classes of property on which a specified board-rate is still maintained.

REDUCED INSURANCE.

We claim, therefore, that, whatever may have been the experience with stand-pipes and hose, pipe-sprinklers, or chemical extinguishers, and the like, in the past, any property properly fitted with Automatic Sprinklers is entitled to be and can be insured at a reduced rate, sufficient at least to pay a fair interest on the investment. Further, it makes total loss a very remote possibility, thus protecting *the uninsured portion of the property*, and insuring the manufacturer against

LOSS OF PROFITS AND BUSINESS,

which a total or even partial loss of his factory would involve.

The records of the Factory Mutual Insurance Companies show that, by systematic protection, this loss of profits and business has been largely reduced in the great manufacturing business of the country, as a whole; but how about the average individual manufacturer, who says:

"I NEVER HAD A FIRE IN MY LIFE,"

and who thinks every other establishment more likely to burn than his, and that a fire would almost (?) go out of itself in his particular factory, if started?

Unless such a man can be impressed with the truth of the old saying that

"ACCIDENTS WILL HAPPEN

in the best-regulated families," we must give him up, and turn our attention to the "burnt children who dread the fire."

We here give the names of several first-class concerns, who have thus assured us of their security when we presented the matter of protection to them, and have since suffered *serious loss of business* by fire:—

Ansonia Clock Co., Brooklyn, N. Y.	Loss	\$900.000
Holmes, Booth & Hayden Company, Waterbury, Conn.	"	300.000
Wakefield Rattan Co., Wakefield, Mass.	"	350.000
Havemeyer Sugar Refinery, Brooklyn, N. Y.	"	1.500.000

The first two were *considered* safe metal-working establishments, with city water and fire-departments at their doors. We hold, therefore, that no prosperous manufacturer can afford to be without the large measure of security against loss of profits and business which only the Automatic Sprinkler gives, and at a cost on the average of little more than he has to pay annually for insurance.

A SMALL FIRE,

for which the owner receives but a few thousand dollars from the insurance companies, may destroy valuable special machinery which cannot be bought, but has to be built, or stock which requires a long time for preparation or seasoning, and thus seriously interferes with the product of the factory.

A TOTAL LOSS

may wipe out an entire year's business, put an end to valuable contracts, and compel old customers to deal with competitors.

The Automatic Sprinkler gives security against this loss, such as no other apparatus has ever afforded; and the owners of our vast manufacturing properties, after years of experience, with the strongest incentive to learn as to the most efficient fire apparatus, are now rapidly introducing the Automatic Sprinkler, as will be seen by examining the long list of prominent establishments already in a greater or less degree supplied with them. (See p. 17.)

A NEW QUESTION.

HOW MUCH FIRE CAN HYDRANTS EXTINGUISH?

If a common reply to the danger of fire is: "I never had a fire," and by implication, "I never shall have one," a more frequent reply is: "I have a very fine hydrant system and abundance of water." Let us examine the value of this protection. Perhaps there is nothing more striking in the experience of firemen than the rapidity with which a fire *appears* to start, and gain headway. It is true that, before it was discovered, it was quite insignificant; a pailful of water would have extinguished it, — a Grinnell Automatic Sprinkler would have confined it to the spot, — but in a few moments it has spread with lightning-like rapidity over the entire room. Grant, if you please, that the pumps of the factory are of excellent construction and promptly applied to this "fine hydrant system," the question is, what *quantity* of water must be supplied in order to extinguish this now raging fire? We take the case of a mill, 75 feet wide by 325 feet long, four stories high, with an attic, that actually burned to the ground in less than three hours.

The amount of combustible material in the floors and roof of this building, exclusive of stock, amounted to about twenty-eight inches of thickness of wood over the entire ground area. When this dry wood is once burning at a rate which shall consume the entire quantity in three hours, what will stop it? A proper calculation, which we need not give in detail, of the quantity of water necessary to *arrest* this fire, shows it to be at the prodigious rate of 5,000 gallons per minute, if none were wasted, but all were *judiciously* applied only where needed. To supply this quantity would require 40 streams from 1-inch nozzles, and about a 400 horse-power pump. Has the mill-owner such a fire apparatus? Can the city department give it to him? It is no surprise, then, that the attention of the firemen is directed to protecting *neighboring property*, for they know by experience that they cannot *save the mill*.

We unhesitatingly declare the hydrant system to be an inadequate and fallacious protection when resorted to after a fire has gained any considerable headway. All that we can expect of it is to confine the fire to the building, or block of buildings, when the fire has once got under way; that is its extent and function. The primary function of the Grinnell Automatic Sprinkler is to confine the fire to the spot where it originated, and prevent the ceilings, floors, stock, and all other combustibles, from getting well on fire.

FOR THE PROTECTION OF STORES AND WAREHOUSES,

the Automatic Sprinkler is no less effective and valuable.

Stores in our large cities are now built six or more stories high, making it very difficult to control a fire which has gained any headway in them, and the most experienced fire-engineers declare the need of some more effective appliance for this purpose.

A fire in the

"DRY-GOODS DISTRICT" IN NEW YORK,

over an area equal to the Boston fire, would result in loss equal to the Chicago and Boston fires combined; wipe out to a great extent the insurance capital of the country; bankrupt or impair the credit of hundreds of manufacturers and jobbers who would not receive full insurance; and the banks and capitalists would have to lose what the manufacturers and jobbers could not pay.

Such a loss would be an injury to every business man in the country; and every property-owner would for years after have to pay the insurance companies double a fair rate for insurance, as was the case after the Chicago and Boston fires.

In the opinion of leading underwriters and business men, such a catastrophe is by no means a remote possibility. A perfectly calm night, and six inches of snow on the roofs, very likely prevented it, in the winter of 1878, from the fire in Worth street.

The stores in this district are generally two stories below the sidewalk, and five or six above; the floors are so constructed as to favor the spread of fire, and they have open stairways and elevators from sub-cellar to roof; and, further, the city water supply is very limited for the purpose of controlling a large fire.

The constantly increasing amount of manufacturing of various kinds carried on in city stores largely increases the chances of fire.

We are prepared to show that the Automatic Sprinkler will give a great measure of security in such stores, and at small cost.

It is natural to suppose that, in case of a fire in the upper story of one of the lofty city stores or warehouses referred to, the sprinklers might fail of their purpose because of an ineffective head of water from the public main; but the necessary pressure can be readily obtained from a steamer, by attaching its hose to the pipe supplying the sprinklers. In this way the steamer can effectively supply the sprinklers in less time than it would require to gain access to the building.

Edward Atkinson, President of the Boston Manufacturers Mutual Fire Insurance Company, in an address delivered to the convention of the chief engineers of the fire departments of the United States, Sept. 14, 1880, alludes to this subject as follows: —

Tenants and occupants are learning to protect themselves better; the combinations for electric fire-alarms are extending; and the Parmelee Automatic Sprinkler — the most effective instrument for extinguishing fire that there is in existence to-day — is beginning to be introduced in some premises besides those that

are insured in the mutual companies, in spite of the tacit or active opposition of that class of underwriters — small, I hope, in number — who discourage all improvement in this direction, and who prefer the chances of betting on bad risks to the more certain prospect of smaller immediate gains from safer methods.

These sprinklers are generally used, of course, as a self-operating fire-extinguisher, with water standing in the system of pipes to which they are attached, ready for distribution by the action of heat; but I wish especially to suggest to you their use as a means of distributing water into the upper stories of high buildings from your steam fire-engines.

The arrangement would consist of the usual distribution of Automatic Sprinklers in the building, attached to a system of pipe, with a connection on the main supply-pipe at or near the ground, to which hose from the steamers can be attached.

The great advantage of saving the time necessary to gain access to such buildings, putting all the available water just where the fire is and nowhere else, and this without admitting air to support combustion, must be apparent to you all. They cannot waste any water, or by any possibility delay or interfere with any other efforts that may be deemed necessary to save property.

The admitted need of some more certain and effective means of extinguishing fire in the more inaccessible portions of our lofty city buildings, seems to justify attention to an appliance which has repeatedly proved itself a success by practical working.

If in addition to the many cases of actual fire where the Automatic Sprinkler has demonstrated its efficiency, any further proof was needed, we could refer to convincing tests to which it has been subjected by committees and individuals, but we content ourselves with the eminently practical demonstration, a list of actual fires extinguished.

LIST OF FIRES EXTINGUISHED.

♦♦♦

Fire No. 1.

AMERICAN LINEN COMPANY,

FALL RIVER, MASS.

Feb. 12, 1877, a fire occurred in the picker-room of the American Linen Mill in Fall River, which is fully described in a paper read before the New England Cotton Manufacturers Association, as follows:—

“The water was *shut out* of the extinguishers at the time of the fire, but was turned on as quickly as possible. After the fire was extinguished, it was a matter of surprise that *all* of the extinguishers in the room were discharging water, showing that the heat had been sufficient to unsolder the caps before the water could be let on, notwithstanding the fire did comparatively little damage. If the water had been standing in the pipes, it would have been applied to the fire still sooner, and the loss would have been less. The scorching of the ceiling of the room and breaking of glass in the windows indicated far more heat, even at a distance from where the fire started, than has been shown necessary to operate the extinguishers.

“It is necessary to state the fact that steam was let into the room at the same time that the water was turned on; but it matters not for our purpose whether steam or water put the fire out; no one doubts but that the water would do it.”

In explanation of the fact that the water was shut off, it may be stated that this was done for the reason that some of these sprinklers leaked, on account of being imperfectly soldered. With the sprinklers as now made there is absolutely no trouble from this source.

This occurrence is instructive in demonstrating the working of the Automatic Sprinklers, if used where the water is not allowed to stand in the pipes on account of freezing, or where it is impossible to have a head of water, and pumps must be the only source of supply.

In such places they will save the unnecessary wetting down of property, or, what is worse, its destruction by fire, by distributing the available water in *abundance* on the fire only, instead of wasting it over so great an area as to make its distribution *inadequate to suppress the fire*, as has too frequently been the result with perforated pipe sprinklers.

Fire No. 2.

MERCHANTS MANUFACTURING COMPANY,

FALL RIVER, MASS.

Soon after, in the summer of the same year, a fire occurred in the picker-room of the Merchants Manufacturing Company in Fall River, which was provided with Automatic Sprinklers. Hose was used with the utmost promptness, and no doubt would have, or did, put out the fire; nevertheless, five or six sprinklers

unsoldered and went to work before the hose was used. I was recently told that the sprinklers did not, in this case, throw much water. Investigation showed them to be connected to a long line of supply-pipe, part of it of not half the capacity that we should provide, and with a globe-valve, instead of a gate-valve, to shut off the water. This fact is mentioned as showing the importance of a proper arrangement of this appliance.

Fire No. 3.

BATES MANUFACTURING COMPANY,

LEWISTON, ME.

A fire occurred at the Bates Mills, Lewiston, Me., Aug. 12, 1878. Here the Automatic Sprinklers effectually prevented a strong fire, which was burning in a room where there were no sprinklers, from entering a room where they were placed. No other apparatus would have done the work of the Automatic Sprinklers in this case, as the attention and efforts of the men in charge of the fire-apparatus were directed to other parts of the mill where the fire was gaining headway.

Two stories of this mill, in which there was no fire, were deliberately wet down at this time with pipe sprinklers, it being impossible to locate the fire, on account of the dense smoke which filled the entire building.

The following letter from Mr. Barker to our Company tells the story of this fire in detail:—

BATES MANUFACTURING COMPANY, LEWISTON, Aug. 12, 1878.

FREDERICK GRINNELL, Esq.,

President Providence Steam and Gas Pipe Company, Providence, R. I.:—

Dear Sir,—Your favor of the 15th inst. is received, and I most cheerfully comply with your request for information as to the working of the Automatic Sprinkler at the fire which has just occurred at our mill. They were put to a peculiar test, which, in an especial manner, demonstrates their efficiency and value.

The picker-room of our woolen-mill, in which the Automatics were placed, is partitioned out of the basement of the mill by a brick partition. The fire started in a wool-bin in the basement, outside of the picker-room, where there were no sprinklers; and, in spite of all efforts to extinguish it with buckets of water, soon burned up a stair-way, and spread rapidly through the entire first story, where it was finally stopped.

At the same time the fire burned out a window in the brick partition of the picker-room, and soon the contents of the room would have been on fire; but, before it could burn anything in the room, three of the Automatics were unsoldered, and completely wet down the burning window-frame, and prevented the fire from entering the room. The Automatics were unsoldered entirely by the heated air which came through the broken window; for, although there was a large quantity of oily wool in bins near the window, and the usual amount of wool lint covering the wood-work, there was not the least sign of any fire inside the window. I am perfectly sure that if we had had the Automatics in the room where the fire started it would have been put out at once.

Nothing could have been more satisfactory than the working of the apparatus. It had been in place over two years, with the water standing in the pipes, without any attention or care.

I certainly prefer the Automatics to sprinkling pipes; shall at once order more, and hope in time to have our entire property protected by them.

Yours truly,

(Signed)

C. I. BARKER,

Agent Bates Manufacturing Company.

Fire No. 4.

BATES MANUFACTURING COMPANY,
LEWISTON, ME.

A fire occurred again at the Bates Mills, Sept. 9, 1878, in a wool-bin in the picker-room. This fire proved to have been incendiary. It was set at the noon hour, when no one was in the room, and was completely put out by one Automatic Sprinkler, and so quickly that the oily cotton, which was lighted and thrown on top of the wool, was not all consumed; and by this it was known to have been set on fire.

It should be stated that the sprinkler which put out this fire was one sent to the mill to go into a dry-room, and was soldered with 212° solder, instead of the 155° commonly used. It was stamped 212°, and found to be so by actual test.

Fire No. 5.

BERKSHIRE WOOLEN COMPANY,
GREAT BARRINGTON, MASS.

Feb. 17, 1879, a fire occurred in the picker-room of the Berkshire Woolen Company at Great Barrington, Mass. Here the Automatic Sprinklers worked with surprising promptness and perfect success, capturing the fire before any other means could be used. The owners strongly endorsed the sprinklers in a letter informing us of the occurrence, saying: "Three sprinklers put the fire out in no time," and that they "did not see much danger from fire where they were placed."

Fire No. 6.

WHITTENTON MANUFACTURING COMPANY,
TAUNTON, MASS.

The next fire occurred in the dry-room of the Whittenton Manufacturing Company, Taunton, Mass., March 16, 1880. This dry-room was about 50' × 60', and hung full from ceiling to floor with cotton laps, dyed black. It was supplied with thirty Automatic Sprinklers, of which twenty-six were soldered with 212° solder, and four with 250° solder. The latter were made expressly to surround the flue from which air heated to 218° entered the room. The result here was a perfect success. The fire started late in the afternoon, when the cotton was dry, and apparently flashed over the whole room, although there was but little stock consumed, except just near the flue where it started. Men were in the lower story of the building when the fire started, and saw the flash. As quickly as possible (in three or four minutes, as stated to me) a stream of water was being thrown from a hose into the room through a window.

The work, however, was already done; twenty-nine out of thirty of the Automatic Sprinklers were showering the fire. The one nearest the window, although at the most remote point from where the fire started, was at work before the window was opened, and showered the man who opened it. The hose could not be used with much effect; as the laps were hung close to the window, the stream struck the ceiling near the window, and knocked off the plastering.

A dry-room of this company was entirely destroyed by fire only about a year before this. Owing to a slight delay in the use of the pipe sprinklers the fire gained such headway as to make it impossible for them to put it out.

Fire No. 7.

COTTON AND WOOLEN GOODS.

SHAW, ESREY & CO., CHESTER, PA.

April 6, 1880, a fire occurred in the dry-room of Shaw, Esrey & Co., at Chester, Pa., provided with 212° Automatic Sprinklers. The fire started between eleven and twelve o'clock at night, as was supposed, by spontaneous combustion. Just at the time one of the owners happened to be driving by; he saw the light, and hurried to find the watchman, who was in the boiler-house. And here the story ends, with the simple statement, that, when they reached the dry-room, three Automatic Sprinklers were at work, and the fire was entirely out.

Fires Nos. 8, 9, and 10.

CANADA COTTON MANUFACTURING COMPANY,

CORNWALL, ONT.

Next follow *three fires* in the dry-room of the Canada Cotton Manufacturing Company at Cornwall, Ont. This dry-room was ceiled overhead with pine boards, and had a blind attic over it. The first fire was promptly and successfully captured by the Automatic Sprinklers, although soldered, as is usual in dry-rooms, with 212° solder. The *next fire* was also put out in the dry-room, as before; but the sparks went through cracks in the ceiling into the attic, set the roof on fire, and was put out with hose. The *third fire* started near the lower end of a wooden ventilating-flue, which ran from near the floor up through the roof. The fire started several sprinklers in the room; but it burned up *inside* the wooden flue, in which there were no sprinklers, and set the roof on fire; and of course this had to be put out with hose, while the sprinklers *did the work inside the room*.

In explanation of the apparent neglect of the above company to make this dry-room more secure after the first fire, it should be stated that they were building a new dry-room, which has since been completed for the Wood's process of drying. These three fires occurred April 6, April 20, and July 20, 1880. These fires are instructive. The first shows that 212° sprinklers may work before a ceiling is set on fire. The second shows the danger of a ceiling under an attic in which there are no sprinklers, or a ceiling forming a concealed space, where fire can burn out of the reach of water. The third shows the need of having ventilating-flues, dust-boxes, etc., made of sheet-iron instead of wood, or of protection to the inside of wooden ones.

Fire No. 11.

CORDAGE-FACTORY,

L. WATERBURY & CO., BROOKLYN, N. Y.

Aug. 11, 1880, a fire occurred at the cordage-factory of L. Waterbury & Co., Brooklyn, N. Y. It started in a one-story brick and iron storehouse, which was judged to be too secure to require Automatic Sprinklers. This storehouse contained over four hundred bales of hemp, which were completely consumed,

and the building ruined, notwithstanding the prompt action of the fire department. Within fifteen feet of this storehouse stood a three-story jenny-house two hundred feet long, divided in the centre by a brick partition. A wooden shute, or elevator, led from the storehouse to the third story of this jenny-house. The fire burned the elevator, and entered the third story, and also caught the roof from the outside. All of the sprinklers in that half of the third story where the fire entered unsoldered; and, by wetting down the building and contents, which consisted of loose hemp, greatly assisted the firemen in extinguishing the fire. A considerable portion of the roof was burned, but was successfully extinguished by the firemen. The door in the brick partition in the third story was open at the time, giving the fire a full opportunity to spread into the remainder of the building, which it certainly would have done had not *nine* of the Automatic Sprinklers been unsoldered by the heat which entered the door, and prevented it.

Here we have the Automatic Sprinklers, in the excitement and confusion of a destructive fire, doing duty *in the right place at the right time*, and, by confining the limits of the fire (not perhaps, but *in all probability*), saving a large loss. And, further, it was forty-eight hours after the fire was over that the silent work performed by these nine sprinklers was discovered.

There are other facts in connection with this fire which it is important to consider. The Cordage Company had two steam fire-pumps connected to a system of hydrant pipe. These pumps were both at work during the fire. The hydrant pipe was connected with the city water-main with the usual check-valve, to prevent the water going into the main if the pressure in it should be reduced by the fire department. In this case, however, four steam fire-engines took water from the steam pumps by attaching hose to the hydrant pipe, and so the pressure on the Automatic Sprinklers in the third story was greatly reduced. As a result, the third story was considerably burned, and *all* the sprinklers were unsoldered; whereas, with a fair pressure, a few sprinklers working near the elevator where the fire entered might have stopped it.

This shows the importance of a water-supply for the Automatic System which cannot be interfered with.

OFFICE OF L. WATERBURY & COMPANY,

Manufacturers of Cordage.

NEW YORK, August 18, 1880.

MR. C. L. HORACK,

Agent of Providence Steam and Gas Pipe Company, Bennett Building, New York:—

Dear Sir,—As there have been a number of erroneous reports in the public press in regard to the fire which took place in parts of our factory, on the morning of the 10th inst., and the means used for extinguishing the same, we hereby give you the facts, as far as we have been able to determine them.

A fire broke out in and totally destroyed buildings covering an area of 83' \times 150', which contained over six hundred bales of manila and hemp, and a considerable number of rope machines. These buildings had no Automatic Sprinklers, or fire apparatus of any kind.

The only other part of our factory touched by the fire was the top story of our jenny-house, No. 3, within ten feet of the burning hemp storehouse, — an open elevator, about five feet square, carrying a solid column of fire from the latter building to the same.

This room, 38' \times 96', was provided with the Parmelee Automatic Sprinkler, and we find that not only in the room on fire every one of the caps over the sprinklers was relieved by the heat, — as is required to allow a discharge of water from them, — but that even in the adjoining jenny-house, No. 2, which was reached by the heated air, but not by the flames, the Automatic Sprinklers next to the communicating door were at work.

It cannot be denied that the Automatics worked under an almost fatal disadvantage, — every one of the private hydrants on our premises having been opened, thereby seriously reducing the water pressure on the sprinklers, particularly as, in addition to the hose companies of our private department, a number of city fire-engines took their water from the same pipes, — a purpose for which they were not intended.

As it appears from the testimony of one of the leading officers of the Brooklyn fire department, these sprinklers greatly assisted the firemen in extinguishing the fire, enabled them to remain on the ground, and contributed largely towards saving the stories below, and all our adjoining property. This ought to set at rest any unfavorable comments on the part of those who were not on the premises at the time of the fire. As soon as our new buildings are completed we propose to provide the same with your Automatic Sprinklers.

Yours respectfully,

L. WATERBURY & CO.

BOSTON, August 14, 1880.

TO THE EDITOR OF THE "COMMERCIAL BULLETIN":—

Dear Sir,—A paragraph in your paper in regard to the alleged want of effectiveness in the service of the Automatic Sprinkler, at the recent fire in the cordage-factory at Williamsburg, may be misleading.

The building burned had, unfortunately, not been fitted with sprinklers; but the very effective service of the sprinkler in the main mill, to which the fire extended, has given the underwriters increased confidence in its value.

It has put out ten fires in textile factories or picker-buildings, since we began to advise its adoption, without material loss either by fire or water, and, in this case, it has served to check the extension of a very threatening fire.

Very truly yours,

EDWARD ATKINSON, *President*

Boston Manufacturers Mutual Fire Insurance Company.

Fire No. 12.

R. KLAUDER & CO.,

PHILADELPHIA, PA.

Sept. 5, 1880, a fire occurred in the calendar-room of R. Klauder & Co., in Philadelphia, from spontaneous combustion during the night. Two or three Automatic Sprinklers worked and stopped the fire; but the watchman found some lingering fire in the goods which were piled in the room, and used hose to put it out.

Fire No. 13.

PROVIDENCE WASTE COMPANY,

PROVIDENCE, R. I.

A fire occurred Oct. 13, 1880, in the building of the Providence Waste Company. This occurrence was rather interesting, as it showed the ability of the Automatic Sprinklers to beat a first-class hose company, when on the premises for the express purpose of watching for fire. This building is two stories high; the first story used for storage, and the second for waste-picking. Automatic Sprinklers were in the second story only. A fire caught from a hot journal in the first story, and was promptly extinguished without much damage by the city fire department. Most of the firemen had left; and the three or four who had remained with a hose-carriage to look after the building were about leaving when the fire broke out in the second story,

this time in *cotton*, not in *wood-work*; and before a stream could be put on by experienced men under the most favorable conditions a shower was coming from an Automatic Sprinkler.

Before this building was fitted with Automatic Sprinklers it was nearly destroyed by fire. It did have *one sprinkler* placed there, unknown to us, over the picker. The fire, however, started in the night, in a lap which stood at the extreme end of the room, twenty feet away from the sprinkler. When the fire-department arrived, this sprinkler was at work; but it was rather lonesome business for one sprinkler in a room 40' or 50' square, which should have had sixteen or twenty sprinklers.

Fire No. 14.

MONTAGUE & WHITE,

PHILADELPHIA, PA.

Nov. 2, 1880, a fire occurred in the picker-room of the mill of Montague & White, Philadelphia. It occurred during the working-hours, starting in a picker, as usual. The men present started to use the hose, but, finding the Automatic Sprinklers at work, had the good judgment to keep the door shut to exclude draught, and shortly found that *three* sprinklers had *completely extinguished* the fire. The fire department came in time to see the ruins (?); the insurance adjuster's services were not required, and no notice of *so slight a fire* appeared in the daily papers.

Fire No. 15.

NATIONAL RUBBER COMPANY,

BRISTOL, R. I.

The next fire occurred Dec. 16, 1880, at the works of the National Rubber Company, at Bristol, R.I., in a building where rubber cloth is made by spreading rubber dissolved in naphtha on the cloth as it passes through a machine. The building was of wood, 20' by about 60'. It was one story, about 10' high, and the roof consisted of 2" x 10" rafters boarded on top and open underneath. The machine in which the fire started was near one end of the room, and had in it two pails or more of the dissolved rubber in which the fire started. The room was provided with the usual system of Automatic Sprinklers, and also a steam-pipe with hose, as a jet of steam has been found better than a *stream* of water to put out a fire in dissolved rubber. At this time the foreman, who was present, promptly used the hose; "but" (as he stated to me a few hours afterwards) "the fire got away from me; we had to leave the building; the sprinklers worked before anything else could be done; the fire was put out, and in less than three minutes I was back in the room opening the windows." The heat of this fire was sufficient to operate *five* sprinklers, wetting the building thirty feet distant from the centre of the fire, and certainly twenty feet or more beyond any fire; and yet the side of the building, within about three feet of the machine, and the roof, were barely scorched, and the wooden frame of the machine but little burned. A cotton-cloth curtain hanging near was completely drenched by the sprinklers before it was scorched.

Fire No. 16.

CHICOPEE MANUFACTURING COMPANY,

CHICOPEE FALLS, MASS.

The next fire in which the Automatic Sprinklers took part was in the picker-building of the Chicopee Manufacturing Company at Chicopee Falls, Mass., Dec. 22, 1880. This building was three stories high, with a basement. The first story contained the lappers, the second pickers, the third cards, and the basement a dust-room. The three stories were provided with both automatic and perforated pipe sprinklers; the former were put in recently as an additional precaution. The fire started inside a lapper in the first story, and communicated to the cotton in the room. The pipe sprinklers were promptly used before the automatics had time to work, and with good effect. The fire, however, was still burning inside the lapper, and had communicated by the dust-flue to the *inside* of the dust-boxes, or trunks, in the second story. Water could not be got into these dust-boxes either by hose or sprinklers; but, as soon as the fire burned through them, *five Automatic Sprinklers met it with the needed water*. In the first story there was a long struggle with the fire inside the lapper, and in a pile of cotton in the room with hose, before it was completely put out. The pipe sprinklers were turned on and off several times to aid in driving out the smoke, and were found useful for that purpose. One of the Automatic Sprinklers in the first story, near the lapper, did go to work, whether just before the pipe sprinklers were turned on, or during an interval when they were shut off, is not certainly known. It could not have been while they were at work, as the cap could not unsolder when drenched with cold water. The fact that this one sprinkler worked where a fire was completely controlled by pipe sprinklers and hose, although not affecting the result in any way, shows that they are ever ready to strike if they have a chance. Mr. Wattles, the agent of the company, who had personal charge of this fire, speaks in the highest terms of the Automatic Sprinklers, and states that, although the third-story carding-room was completely filled with smoke, with danger of fire, he had determined not to wet it down with pipe sprinklers, but to wait for the automatics to do the work, or at least make known the presence of fire.

Fire No. 17.

PROVIDENCE, R.I., March 19, 1881.

In our report of January 3, 1881, to the Boston Manufacturers Mutual Fire Insurance Company, furnishing "a statement of the work that had been done by the Parmelee Automatic Sprinkler in actual cases of fire," details were given of sixteen fires. We inadvertently omitted, in that communication, a fire which occurred in the winter of 1878, at the Potomska Mills, New Bedford, Mass. This fire started by spontaneous combustion in a waste can, which had been accidentally left in the mill at night, it having been set one side on top of some boxes filled with hanks of yarn. Before the fire had communicated to anything outside the can, heat was generated sufficient to unsolder an Automatic Head directly over it, and the fire was immediately extinguished. A watchman on duty smelt smoke, and following the trace found the sprinkler at work, and turned off the water.

PROVIDENCE STEAM & GAS PIPE COMPANY.

Fire No. 18.

OFFICE OF THE HOPE THREAD COMPANY.

PROVIDENCE STEAM AND GAS PIPE COMPANY:—

PAWTUCKET, R.I., March 4, 1881.

Gents,— We had a fire in our picker-room last evening, and two of the caps to your Automatic Sprinkler were melted off, and did excellent service. Please send your man out and bring one extra cap (as one was lost), and solder them both on.

Your early attention will greatly oblige,

Yours respectfully,

JOHN F. ADAMS,
Treasurer.

The full particulars of the above fire are these: As N. W. RANDALL, Superintendent of the Hope Thread Company, was passing the picker-house, he saw a sudden flame within, and immediately struck the fire-alarm. It seems a boy had carelessly tossed a bit of cotton into a gas-jet, and it fell upon several open bales, which were instantly in flames. Two Automatics went off, and deadened the fire so promptly that Mr. RANDALL shut the water off as soon as he could. The fire, however, rekindled slightly, as often happens when burning cotton has been wet down, but was easily put out by hose *which by this time* was ready to be brought in play. The fire department arrived with great promptness, and played upon the burnt cotton, which had been taken out of the building, speedily putting out the sparks which linger so tenaciously in cotton. The two heads which operated threw water so quickly that the wood-work, where the burning cotton lay against it, was only slightly scorched. No water had been showered upon the machines, and they were run next morning as if nothing had happened.

Fire No. 19.

TREASURER'S OFFICE, COCHECO MANUFACTURING COMPANY.

F. GRINNELL, ESQ., *President*:—

BOSTON, March 17, 1881.

Dear Sir,— On the 7th inst., at 6 o'clock A.M., a fire was discovered in the picker of this Company's Mill No. 1. The alarm was given, but the use of hose was unnecessary, as the sprinklers had checked the fire before the stream was turned on.

The cotton in the picker consisted of about twenty bales unopened, and ten bales opened, the latter arranged in a row, and near together. There was no loose cotton.

When first seen, these ten bales were on fire, and the four heads of the Parmelee Automatic Sprinkler, which were immediately over them, were at work; the fire was confined to these open bales, and the water from the four heads was sufficient to control and extinguish it.

In short, the Automatic Sprinkler worked in the most satisfactory manner, in all respects.

Yours truly,

H. STOCKTON,
Treasurer.

Fire No. 22.

OFFICE OF THE BOUND BROOK WOOLEN MILLS.

BOUND BROOK, N.J., July 19, 1881.

PROVIDENCE STEAM AND GAS PIPE COMPANY:—

Gentlemen,—Please ship at once by express three Automatic Sprinklers in place of three which we return you to-day by express. A fire in blow room of picker-house this afternoon was put out by one head before hose could be stretched,—in fact, in less than two minutes.

Yours respectfully,

BOUND BROOK WOOLEN MILLS,

By H. L. EINSTEIN,
Treasurer.

Fire No. 24.

OFFICE OF THE PLAINVILLE MANUFACTURING COMPANY.

PLAINVILLE, CONN, August 10, 1881.

PROVIDENCE STEAM AND GAS PIPE COMPANY:—

Gentlemen,—The four heads have arrived. Shall we return the heads and caps to you that went off, or can you send us the right grade of solder, so that we can put the caps on here?

The fire was in our picker-room vault. It came through the picker into the room. Two heads went off in the vault, and two in the room, and put out the fire admirably. We were damaged only on loose stock by fire and water. Our confidence in the Automatics is strengthened.

Truly yours,

E. N. PIERCE,
Secretary and Treasurer.

Fire No. 26.

OFFICE OF GRANGER FOUNDRY AND MACHINE CO.

PROVIDENCE, R.I., Oct. 14, 1881.

MR. FREDERICK GRINNELL, *Prest. Providence Steam and Gas Pipe Co.*:—

Dear Sir,—In answer to your request for information as to the working of the Automatic Sprinklers at the fire in our shop, August 23, 1881, I would say that the operation of the sprinklers in this instance gives me great confidence in their efficiency. The fire was caused by friction of a bearing while the help were present, and, notwithstanding water was at once thrown on the fire with pails, two of the sprinklers worked, and completely put it out.

Yours very truly,

W. S. GRANGER,
Treasurer.

Fire No. 27.

OFFICE OF L. WATERBURY & CO.,

139 FRONT STREET, NEW YORK.

C. L. HORACK, Esq.,

NEW YORK, Nov. 7, 1881.

Bennett Building, New York, Agent of Providence Steam and Gas Pipe Co.:—

Dear Sir, — In regard to the fire which occurred in our mill on the 5th of October, 1881, we append the following particulars: The fire broke out at 10.30 A.M., and was caused by friction from gears in the lower floor of the picker-building. The hose in the building was at once put in use, and with the aid of one Automatic Head, which went off within 1½ minutes after the fire broke out, the same was extinguished without loss. The gears where the fire originated were enclosed in a wooden casing, and while the water from the hose helped to prevent the spread of the flames, the Automatic Head completely extinguished the fire where it originated.

We are very much pleased at this renewed proof of the efficiency of the Parmelee Automatic Sprinkler.

Very truly yours,

L. WATERBURY & CO.

Fire No. 28.

OFFICE OF BORDER CITY MANUFACTURING COMPANY.

MR. FREDERICK GRINNELL,

FALL RIVER, MASS., October 28, 1881.

President Providence Steam and Gas Pipe Co.:—

Dear Sir, — We had a fire 25th inst. in the opening room of our No. 1 Mill. An axe, used to cut the iron hoops of the cotton bales, struck fire, and the flames instantly flashed over twenty-five open bales. Under the direction of our Superintendent, who was present, a powerful stream of water was thrown upon the burning cotton with hose from the stand-pipe close by. Immediately following this, four (4) heads of the Automatic Sprinklers went off and discharged a dense shower over the fire, which, with this assistance, was promptly extinguished.

The efficiency of the Automatic Sprinklers was fully demonstrated. You will please send us eight more for spare ones.

Yours respectfully,

OTIS N. PIERCE,

Treasurer.

Fire No. 29.

OFFICE OF SHAW, ESREY & CO. (LIMITED.)

Manufacturers of Cotton and Woolen Goods.

CHESTER, PA., November 1, 1881.

PROVIDENCE STEAM AND GAS PIPE CO.:—

Gents,— We have sent you by express three (3) Automatic Heads for repairs. We also wish you to send us one-half dozen new ones along with those repaired. We had a fire in our picker-house at No. 3 Mill, yesterday morning, and supposed it was caused by some hard substance going through the picker. Your Automatics worked like a charm, and kept it well under control and confined to one corner. We think it nearly impossible for a fire to get any headway where they are. Our loss is, say \$100, or a trifle over, for stock burned and damaged by water, and we had at the time about 6,000 lbs. of loose picked wool in the room.

Yours truly,

SHAW, ESREY & CO. (LIMITED.)

Fire No. 30.

PICKER-ROOM.— WM. WOOD CO.,

PHILADELPHIA, PA.

Of the fires that have come to our notice in which the Parmelee Automatic Sprinklers have worked the 30th occurred February 22, 1882, at about 9 A.M., in a picker-house at the works of Wm. Wood & Co., in Philadelphia. There were seven Automatics in the room. Water was promptly thrown upon the fire by means of buckets and hand-hose. Notwithstanding the cooling effect produced by dashing water in this way into the room, it was found, when the smoke cleared away, that four or five of the Automatics had been playing upon the flames. The damage produced by this fire was a loss of about 100 lbs. of cotton, and a 6-inch belt burned through.

Fire No. 31.

JAMES AKEN HOSIERY MILL,

PHILMONT, N.Y.

A fire occurred February 28, 1882, at the hosiery mills of James Aken, at Philmont, N.Y. It caught in the lapper-room of the lower mill. This room was protected originally by perforated pipe sprinklers, which still remain, and now the Parmelee system has been put in also. The latter had been recently com-

pleted and the pipes were filled with cold water just before the fire started. As quickly as possible water was let on to the perforated pipe sprinklers. Two Automatics, however, had already gone to work. The others, before they could act, were showered and cooled off by the water thrown by the perforated pipe sprinklers. The fire in this instance was put out, it is true, by the pipe sprinklers, but so also was the whole room wet down. If the fire had been left wholly to the Automatics, the damage by fire could have been but little if any more, and the water damage would have been less.

Fire No. 32.

BATES MANUFACTURING COMPANY.

LEWISTON, ME., March 8, 1882.

MR. EDWARD ATKINSON, Esq., *President* : —

My dear Sir, — Your favor of the 7th came to hand, asking me to give you the particular account of the operation of the Automatic Sprinkler in the recent fire in our Picker No. 2. The fire took in the Crayton opener, came out on the apron, and dropped on the floor; and the first the man saw was quite a flash of fire over the floor. Immediately the man put on a small hand-hose, which we have close to the machine. Now, from this or some other cause, — presume this, — the two Automatics directly over the apron did not melt, hence did not blow off. The fire ran into a large pile of laps close by, and over three laps two of the Automatics blew off. By this time the fire had run back of the apron on to the pile of waste, and one of the Automatic caps blew off. The principal part of the fire was in those laps, and the man with hand-hose at machine, also another man with hydrant-hose, was playing on the laps from door leading to main mill, giving the Automatic Sprinklers no chance to go off, as there was not heat enough only in three places.

The room was solid full of smoke, and our men, of course, somewhat excited, as they could not tell whether Automatics were working or not. The Superintendent turned on the old sprinkler for about three minutes. When the water from the old sprinkler was shut off, the men went in and found no fire, only in those laps, underneath where the water could not reach; also found the three Automatics in full operation, one over the laps. This took place about 6.10 A. M., before I came to the mill.

If I had been there, should not have put on the old sprinklers; at least, I don't think I should.

The Automatics are gauged at 150°, which I think a little too high, as it seems to me more of them should have been blown off. Still, there were two streams of water going on to the cotton in less than one-half minute after the fire was discovered, which smothered it so that no heat could rise to start the Automatics.

My faith in the Automatic Sprinklers is not slackened in the least; in fact is confirmed, as three did blow off, and no doubt saved more serious damage.

Yours truly,

C. I. BARKER,
Agent.

LIST OF FIRES,

IN WHICH THE PARMELEE AUTOMATIC SPRINKLERS HAVE
WORKED SUCCESSFULLY.

No.	1	.	.	Feb.	12, 1877	.	.	American Linen Company, Fall River, Mass.
	2	.	.	Sept.	23, 1877	.	.	Merchants Mills, Fall River, Mass.
	3	.	.	Aug.	12, 1878	.	.	Bates Mills, Lewiston, Me.
	4	.	.	Sept.	5, 1878	.	.	Bates Mills, Lewiston, Me.
	5	.	.	Feb.	17, 1879	.	.	Berkshire Woolen Company, Great Barrington, Mass.
	6	.	.	March	16, 1880	.	.	Whittenton Manufacturing Company, Taunton, Mass.
	7	.	.	April	6, 1880	.	.	Shaw, Esrey & Co., Chester, Pa.
	8	.	.	April	20, 1880	.	.	Canada Cotton Manufacturing Company, Cornwall, Ont.
	9	.	.	July	20, 1880	.	.	Canada Cotton Manufacturing Company, Cornwall, Ont.
	10	.	.	July	30, 1880	.	.	Canada Cotton Manufacturing Company, Cornwall, Ont.
	11	.	.	Aug.	11, 1880	.	.	L. Waterbury & Co., Brooklyn, N.Y.
	12	.	.	Sept.	5, 1880	.	.	R. Klauder & Co., Philadelphia, Pa.
	13	.	.	Oct.	13, 1880	.	.	Providence Waste Company, Providence, R.I.
	14	.	.	Nov.	2, 1880	.	.	Montague & White, Philadelphia, Pa.
	15	.	.	Dec.	16, 1880	.	.	National Rubber Company, Bristol, R.I.
	16	.	.	Dec.	22, 1880	.	.	Chicopee Manufacturing Company, Chicopee Falls, Mass.
	17	.	.	Jan.	1878	.	.	Potomska Mills, New Bedford, Mass.
	18	.	.	March	3, 1881	.	.	Hope Thread Company, Pawtucket, R.I.
	19	.	.	March	7, 1881	.	.	Coheco Manufacturing Company, Dover, N.H.
	20	.	.	March	21, 1881	.	.	Howard Brothers, Springfield, Mass.
	21	.	.	July	15, 1881	.	.	Howard Brothers, Springfield, Mass.
	22	.	.	July	19, 1881	.	.	Bound Brook Woolen Mills, Bound Brook, N.J.
	23	.	.	July	1881	.	.	Springfield Blanket Company, Holyoke, Mass.
	24	.	.	Aug.	8, 1881	.	.	Plainville Manufacturing Company, Plainville, Conn.
	25	.	.	Sept.	5, 1881	.	.	Springfield Blanket Company, Holyoke, Mass.
	26	.	.	Aug.	23, 1881	.	.	Granger Foundry and Machine Company, Providence, R.I.
	27	.	.	Oct.	5, 1881	.	.	L. Waterbury & Co., Brooklyn, N.Y.
	28	.	.	Oct.	25, 1881	.	.	Border City Mills, Fall River, Mass.
	29	.	.	Oct.	31, 1881	.	.	Shaw, Esrey & Co., Chester, Pa.
	30	.	.	Feb.	22, 1882	.	.	William Wood & Co., picker-room, Philadelphia, Pa.
	31	.	.	Feb.	28, 1882	.	.	James Aken Hosiery Mill, Philmont, N.Y.
	32	.	.	Feb.	28, 1882	.	.	Bates Manufacturing Company, Lewiston, Me.

N.B. We do not feel sure that our list is complete, as it is only by accident that we have heard of several of the above fires. We hope all parties, who may have fires in which our sprinkler operates, will communicate with us, in order that our list may be as complete as possible.

The Parmelee Automatic Sprinklers have been supplied to the following establishments:—

NAME.	MAINE.	PLACE.
PORTSMOUTH COMPANY	Berwick.	
LACONIA COMPANY	Biddeford.	
PEPPERELL MANUFACTURING CO.	"	
ANDROSCOGGIN PULP COMPANY .	Brunswick.	
CABOT MANUFACTURING CO. . .	"	
CUMBERLAND MILLS	Cumberland Mills.	
DEXTER WOOLEN COMPANY . . .	Dexter.	
FAIRCHILD PAPER COMPANY . .	East Pepperell.	
UNION MILL	Greenville.	
BATES MILLS	Lewiston.	
D. COWAN	"	
LEWISTON BLEACHERY	"	
LEWISTON MILL	"	
WORUMBO MANUFACTURING CO. .	Lisbon Falls.	
DEERING, MILLIKEN, & CO. . .	Lisbon Plains.	
E. HARGRAVES	North Shapleigh.	
VASSALBORO' WOOLEN CO. . .	North Vassalboro'.	
YORK MANUFACTURING COMPANY.	Saco.	
LOCKWOOD COMPANY	Waterville.	
KENNEBEC FIBRE COMPANY . . .	"	

NEW HAMPSHIRE.

SULLIVAN WOOLEN MILLS . . .	Claremont.
MONADNOCK MILLS	"
SUGAR RIVER PAPER COMPANY .	"
COCHECO MANUFACTURING CO. .	Dover.
SAWYER'S WOOLEN COMPANY . .	"
GREAT FALLS WOOLEN CO. . .	Great Falls.
HILLSBORO' WOOLEN COMPANY .	Hillsboro' Bridge.
CHESHIRE MILLS	Keene.
AMORY MILLS	Manchester.
MANCHESTER MILLS	"
STARK MILLS	"
AMOSKEAG MANUFACTURING CO. .	Nashua.
JACKSON COMPANY	"
SALMON FALLS M'F'G CO. . .	Salmon Falls.
GRANITE MILLS COMPANY . . .	Tilton.

VERMONT.

J. GOULD & SON	Gouldsville.
J. S. GILL	Ludlow.
NORTH POWNAL M'F'G CO. . .	North Pownal.
A. G. DEWEY & COMPANY . . .	Quechee.

NAME.	PLACE.
BURLINGTON WOOLEN COMPANY .	Winooski Falls.
F. S. MCKENZIE	Woodstock.

MASSACHUSETTS.

B. F. PHILLIPS & SON	Adams.
RENFREW MANUFACTURING CO. .	"
J. P. BRADLEE	Ballard Vale.
HALL & COMPANY	Bemis Station.
BLACKINGTON WOOLEN CO. . .	Blackington.
BOSTON DUCK COMPANY	Bonds Village.
BOSTON CORDAGE COMPANY . .	Boston.
PARKER, WILDE & CO.	"
MASS. INST. OF TECHNOLOGY .	"
MEMORIAL HALL	Cambridge.
MASON & HAMLIN	Cambridgeport.
CHICOPEE MANUFACTURING CO. .	Chicopee Falls.
COCHECO MANUFACTURING CO. .	"
LANCASTER MILLS	Clinton.
DANVERS LUNATIC ASYLUM . . .	Danvers.
MERCHANTS WOOLEN COMPANY .	Dedham.
B. B. & R. KNIGHT	Dodgeville.
F. W. BIRD & SON	East Walpole.
MONTAUK MILL	Fall River.
POCASSETT MANUFACTURING CO.	"
TECUMSEH MILLS	"
WAMPANOAG MILL	"
MERCHANTS M'F'G CO.	"
RICHARD BORDEN M'F'G CO. . .	"
TROY COTTON AND WOOLEN CO.,	"
UNION COTTON M'F'G CO. . . .	"
FLINT MILL	"
WAMSUTTA WOOLEN MILL . . .	"
CHACE WOOLEN MILL	"
OSBORNE WOOLEN MILL	"
BARNARD M'F'G COMPANY . . .	"
BORDER CITY MILLS	"
SHOVE MILLS	"
UNION COTTON CO.	"
STAFFORD MILLS	"
BERKSHIRE WOOLEN COMPANY .	Great Barrington.
MERCHANTS MANUFACTURING CO.	Hamilton.
L. BRIGGS & SON	Haydenville.
HEBRON MANUFACTURING CO. .	Hebronville.

MASSACHUSETTS, *cont'd.*

NAME.	PLACE.
HINGHAM CORDAGE COMPANY .	<i>Hingham Centre.</i>
BEEBE & HOLBROOK COMPANY .	<i>Holyoke.</i>
T. F. KEGAN	"
HAMPDEN MILLS	"
SPRINGFIELD BLANKET CO. . .	"
NONOTUCK PAPER COMPANY . .	"
WINONA PAPER COMPANY . . .	"
MONUMENT MILL	<i>Housatonic.</i>
IPSWICH MILL	<i>Ipswich.</i>
EVERETT MILLS	<i>Lawrence.</i>
ARLINGTON MILLS	"
WASHINGTON MILLS	"
RUSSELL PAPER COMPANY . . .	"
PEMBERTON MILLS	"
PACIFIC MILLS	"
LAWRENCE DUCK COMPANY . . .	"
PEMBERTON COMPANY	"
F. & P. MUNROE CO.	"
ATLANTIC COTTON MILL	"
NONOTUCK SILK COMPANY . . .	<i>Leeds.</i>
G. W. WHEELWRIGHT PAPER CO.	<i>Leominster.</i>
LAWRENCE MANUFACTURING CO. .	<i>Lowell.</i>
MERRIMAC M'F'G CO.	"
LOWELL HOSIERY COMPANY . . .	"
SHAW STOCKING COMPANY . . .	"
APPLETON COMPANY	"
MANCHAUG COMPANY	<i>Manchaug.</i>
NEW BEDFORD CORDAGE CO. . .	<i>New Bedford.</i>
MORSE TWIST DRILL COMPANY .	"
POTOMSKA MILLS	"
PAIRPOINT MANUFACTURING CO. .	"
WAMSUTTA MILLS	"
STANDARD YARN COMPANY . . .	<i>Newburyport.</i>
OCEAN MILLS	"
PEABODY MILLS	"
DUDLEY HOSIERY COMPANY . . .	<i>Newton Lower Falls.</i>
NEWTON MILLS	<i>Newton Upper Falls.</i>
BEAVER MILL	<i>North Adams.</i>
WILLIAMSTOWN MILL	"
ARNOLD PRINT WORKS	"
N. POWNAL M'F'G COMPANY . .	"
GLEN WOOLEN COMPANY	"
FREEMAN PRINT-WORKS	"
EBEN SUTTON	<i>North Andover.</i>
RAY WOOLEN MILL	<i>North Bellingham.</i>
C. P. TALBOT	<i>North Billerica.</i>
L. LINCOLN & CO.	<i>North Dighton.</i>
W. E. TILLOTSON	<i>Pittsfield.</i>

NAME.

PLACE.

PLYMOUTH WOOLEN COMPANY .	<i>Plymouth.</i>
N. BOYNTON & COMPANY . . .	"
B. B. & R. KNIGHT	<i>Readville.</i>
NAUMKEAG COTTON COMPANY . .	<i>Salem.</i>
VERNON BROTHERS & CO. . . .	<i>Salmon Falls.</i>
L. L. BROWN PAPER COMPANY .	<i>South Adams.</i>
GROVELAND MILLS	<i>South Groveland.</i>
PHILLIPS MANUFACTURING CO. .	<i>Springfield.</i>
COHANNETT MILLS	<i>Taunton.</i>
ELIZABETH POOLE MILLS . . .	"
REED & BARTON	"
CANOE RIVER MILL	"
WHITTENTON M'F'G CO.	"
PALMER MILL	<i>Three Rivers.</i>
AMERICAN WATCH COMPANY . .	<i>Waltham.</i>
OTIS COMPANY	<i>Ware.</i>
SAYLES, OWEN & COMPANY . . .	<i>Warren.</i>
WARREN COTTON COMPANY . . .	"
AMERICAN CARPET LINING CO. .	<i>Watertown.</i>
E. W. HOLBROOK	<i>West Boylston.</i>
AGAWAM PAPER COMPANY . . .	<i>West Springfield.</i>
WILLIAMSTOWN M'F'G CO. . . .	<i>Williamstown.</i>

RHODE ISLAND.

ALBION COMPANY	<i>Albion.</i>
ALLENDALE COMPANY	<i>Allendale.</i>
W. H. POPE	<i>Allenville.</i>
ORIENTAL PRINT WORKS	<i>Apponaug.</i>
LONSDALE COMPANY	<i>Ashton.</i>
BERKLEY COMPANY	<i>Berkley.</i>
BLACKSTONE M'F'G CO.	<i>Blackstone.</i>
NATIONAL RUBBER COMPANY . . .	<i>Bristol.</i>
EAGLE DYE WORKS	<i>Central Falls.</i>
QUIDNICK COMPANY	"
DYERVILLE COMPANY	<i>Dyerville.</i>
ROBERT RODMAN	<i>Lafayette.</i>
LONSDALE MANUFACTURING CO. .	<i>Lonsdale.</i>
AQUIDNICK MILL	<i>Newport.</i>
ATLANTIC MILLS	<i>Olneyville.</i>
CHARLES FLETCHER	"
JAMES O. INMAN	<i>Pascoag.</i>
H. A. KIMBALL	"
FALES & JENKS MACHINE CO. .	<i>Pawtucket.</i>
UNION WADDING COMPANY . . .	"
HOPE THREAD COMPANY	"
LITTLEFIELD BROTHERS	"
PEACEDALE MANUFACTURING CO. .	<i>Peacedale.</i>
ORIENTAL MILLS	<i>Providence.</i>
AMERICAN SHIP WINDLASS CO. .	"

RHODE ISLAND, *cont'd.*

NAME.	PLACE.
POSNEGANSETT COMPANY . . .	Providence.
VALLEY WORSTED MILLS . . .	"
GROTON MANUFACTURING CO. . .	"
BUTLER HOSPITAL	"
H. E. SMITH & CO.	"
PROVIDENCE TOOL COMPANY . . .	"
KENDRICK LOOM HARNESS CO. . .	"
PAINE & SACKETT	"
ARKWRIGHT MANUFACTURING CO. .	"
WEYBOSSET MILLS	"
BERNON MANUFACTURING CO. . .	"
FLETCHER MANUFACTURING CO. . .	"
WILLIAM A. HARRIS	"
PROV. STEAM & GAS PIPE CO. . .	"
PROVIDENCE WASTE COMPANY . . .	"
QUIDNICK COMPANY	Quidnick.
WALTON & BLAKELY	Richmond Switch.
GREENE MANUFACTURING CO. . .	Riverpoint.
KENYON & COON	Shannock Mills.
CUTLER MANUFACTURING CO. . .	Warren.
B. B. & R. KNIGHT	White Rock.
WOONSOCKET COMPANY	Woonsocket.
SOCIAL MANUFACTURING CO. . . .	"
LIPPETT WOOLEN COMPANY	"

CONNECTICUT.

HOME WOOLEN COMPANY . . .	Beacon Falls.
WILKINSON BROTHERS & CO. . .	Birmingham.
BROADBROOK WOOLEN COMPANY	Broadbrook.
CHELSEA PAPER COMPANY . . .	Greenville.
PRATT & WHITNEY COMPANY . .	Hartford.
HOME WOOLEN COMPANY	"
ASHLAND COTTON COMPANY . . .	Jewett City.
MERIDEN BRITANNIA COMPANY . .	Meriden.
EDWIN MILLER & CO.	"
AMERICAN HOSIERY COMPANY . .	New Britain.
NEW BRITAIN KNITTING CO. . .	"
STANLEY RULE AND LEVEL CO. . .	"
M. SEWARD & SON	New Haven.
JOHN M. MARLIN	"
MATHUSHEK PIANO M'F'G CO. . .	"
FALLS COMPANY	Norwich.
PLAINVILLE MANUFACTURING CO.	Plainville.
ROCK MANUFACTURING CO. . . .	Rockville.
RIVERSIDE WOOLEN COMPANY . . .	Stafford.
YALE LOCK COMPANY	Stamford.
TOTOKET MILL	Versailles.
HOLMES, BOOTH, & HAYDEN . . .	Waterbury.

NAME.

PLACE.

SMITHVILLE MANUFACTURING CO.	Willimantic.
WILLIMANTIC LIXEN COMPANY . .	"

NEW YORK.

SCHUYLER & BLOOD	Amsterdam.
NYE & WAIT	Auburn.
E. D. CLAPP MANUF'G CO. . . .	"
D. M. OSBORNE & CO.	"
NEW YORK BAGGING COMPANY . .	Brooklyn.
PLANET MILLS	"
H. R. WORTHINGTON HYDRAULIC WORKS	"
CHAS. VAN BENTHUYSEN & SON . .	Castleton.
G. W. CHADWICK	Chadwick Mills.
HARMONY MILLS	Cohoes.
ROOT MANUFACTURING COMPANY . .	"
J. H. PARSONS & CO.	"
HIMES & VAIL	"
TROY MANUFACTURING CO. . . .	"
HUGO FUNKE	College Point.
INDIA-RUBBER COMB COMPANY . .	"
W. A. WOOD REAPING AND MOW- ING MACHINE COMPANY	Hoosick Falls.
TITUS SHEARD	Little Falls.
NEWBURG STEAM COTTON CO. . .	Newburg.
ADAMS & BISHOP	"
H. B. CLAFLIN & COMPANY . . .	New York City.
APPLETON STURGIS	"
L. WATERBURY & CO.	"
EATON COLE AND BURNHAM CO. . .	"
WATERHOUSE BROTHERS	"
THOMPSON KINGSFORD	Oswego Falls.
OSWEGO FALLS M'F'G CO. . . .	"
JAMES AKEN	Philmont.
JAMES FABYR	Sag Harbor.
J. B. SHEFFIELD & SON	Saugerties.
LAKE GEORGE M'F'G CO.	Ticonderoga.
LUDLOW VALVE COMPANY	Troy.
FULLER, WARREN & CO.	"
ORR & CO.	"
J. H. & N. A. WILLIAMS	Utica.
GLOBE WOOLEN COMPANY	"
MOHAWK V. C. COMPANY	"
WILD & DEVEREAUX	"
EMPIRE WOOLEN COMPANY	"
UTICA STEAM COTTON CO. . . .	"
CHARLES WILD	Valatie.
VALATIE COTTON MILL	"
SARATOGA VICTORY M'F'G CO. . .	Victory Mills.

NEW JERSEY.

NAME.	PLACE.
H. L. EINSTEIN	<i>Bound Brook.</i>
BOUND BROOK WOOLEN CO. . .	"
ELIZABETHPORT CORDAGE CO. .	<i>Elizabethport.</i>
ANCONA PRINTING COMPANY . .	<i>Gloucester.</i>
GLOUCESTER GINGHAM COMPANY .	"
GLOUCESTER IRON WORKS . . .	"
MATHIESSEN & WIECHERS . . .	<i>Jersey City.</i>
LAMBERTVILLE PAPER COMPANY	<i>Lambertville.</i>
SAMUEL CRUMP	<i>Mont Clair.</i>
NORFOLK & NEW BRUNSWICK	
HOSIERY COMPANY	<i>New Brunswick.</i>
CLARK THREAD COMPANY . . .	<i>Newark.</i>
T. P. HOWELL & CO.	"
REID & BARRY	<i>Passaic.</i>
DOLPHIN MANUFACTURING CO. .	<i>Patterson.</i>
J. C. TODD	"
DOLPHIN MANUFACTURING CO. .	"
DANFORTH LOCOMOTIVE WORKS .	"
BARBOUR FLAX SPINNING CO. .	<i>Raritan.</i>
SOMERSET MANUFACTURING CO. .	"

PENNSYLVANIA.

WESTERN FILE COMPANY . . .	<i>Beaver Falls.</i>
BEAVER FALLS COTTON CO. . .	"
C. W. & J. PEIRCE	<i>Bristol.</i>
BRISTOL PUMP COMPANY . . .	"
SHAW, ESREY & CO.	<i>Chester.</i>
ALFRED VEZIN	<i>Frankford.</i>
WOODVILLE WOOLEN MILL . .	<i>Johnstown.</i>
JOHN BROWN SONS	<i>Philadelphia.</i>
JAMES SMITH & CO.	"
W. C. HAMILTON & CO. . . .	"
FINLEY & SCHLICHTER	"
GEO. S. HARRIS & SON	"
J. B. STETSON	"
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JAS. LEE & SON	"
WILLIAM WOOD & CO.	"
THOMAS DOLAN & CO.	"
M. A. FURBUSH & SON	"
DORNAN BROTHERS & CO. . . .	"
PENNSYLVANIA KNITTING CO. .	"
R. D. WOOD & CO.	"
BROMLEY BROTHERS	"
S. B. & M. FLEISHER	"
JAMES DOAK, JR., & CO. . . .	"
HARPST, MONTAGUE & CO. . .	"
RUSSELL B. WARD	<i>Portchester.</i>

DELAWARE.

NAME.	PLACE.
JOSEPH BANCROFT & SON . . .	<i>Wilmington.</i>

MARYLAND.

WILLIAM HOOPER & CO.	<i>Baltimore.</i>
MOUNT VERNON MANUF'G CO. .	"
JAMES GARY & SON	"
JAS. BANCROFT & SONS	"
GAMBRILL SONS & CO.	"
P. R. GOLTFITER	<i>Spring Grove.</i>

GEORGIA.

FULTON COTTON SPINNING CO. .	<i>Atlanta.</i>
EAGLE PHENIX M'F'G CO. . . .	<i>Columbus.</i>

SOUTH CAROLINA.

D. E. CONVERSE & CO.	<i>Glendale.</i>
CLIFTON MILLS	"
PIEDMONT MANUFACTURING CO. .	<i>Piedmont.</i>

NORTH CAROLINA.

CLIFTON MANUFACTURING CO. .	<i>Clifton.</i>
F. & H. FRIES	<i>Salem.</i>

TENNESSEE.

J. C. JOHNSON & CO.	<i>Memphis.</i>
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VIRGINIA.

NORFOLK KNITTING COMPANY .	<i>Norfolk.</i>
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ALABAMA.

ANNISTON MANUFACTURING CO. .	<i>Anniston.</i>
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CANADA.

ROSAMOND WOOLEN COMPANY .	<i>Almonte.</i>
COATICOOK COTTON COMPANY .	<i>Coaticook.</i>
CORNWALL WOOLEN COMPANY .	<i>Cornwall.</i>
CANADA COTTON M'F'G CO. . .	"
HAMILTON COTTON COMPANY .	<i>Hamilton.</i>
V. HUDSON COTTON COMPANY .	<i>Hockelago.</i>
PATON WOOLEN M'F'G CO. . .	<i>Sherbrooke.</i>
OLIVER WILBY & CO.	<i>Weston.</i>

THE GRINNELL SUPERSEDES THE PARMELEE.

THE REASON WHY.

In what we have said concerning the Parmelee Sprinkler it has not been our purpose to detract one iota from the full measure of credit it deserves as a fire-extinguisher. We have been the sole manufacturers of it, and we control the patents which cover its improved form. But of our own free choice we have now abandoned it, for reasons which we will briefly state: —

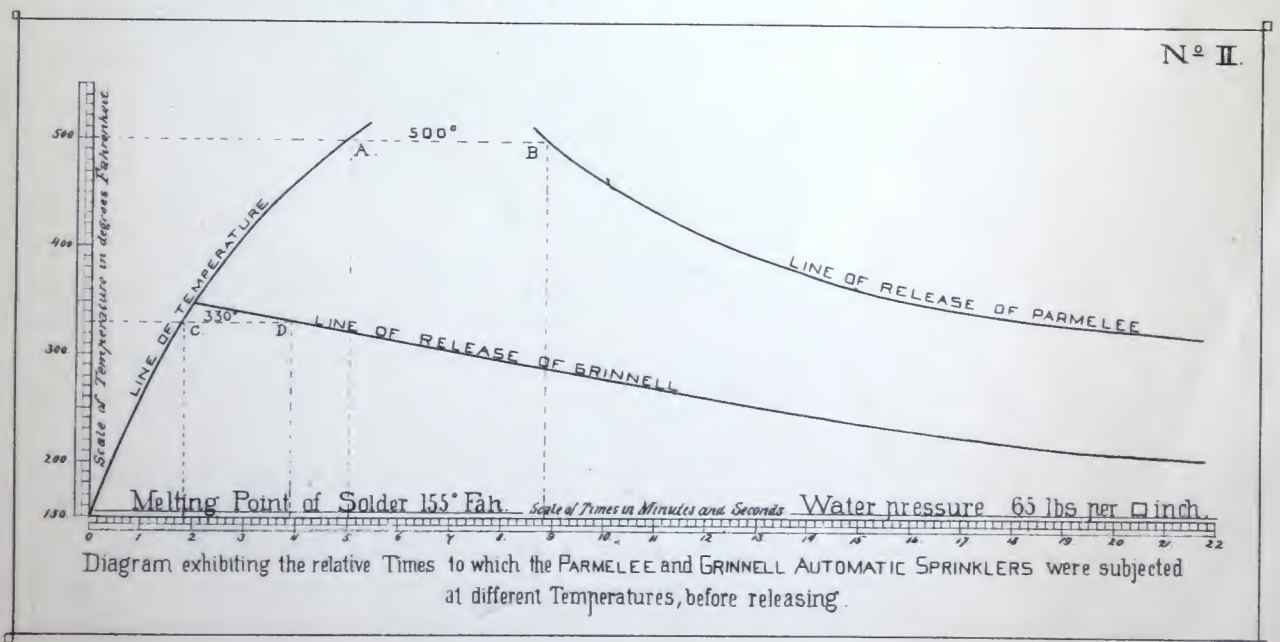
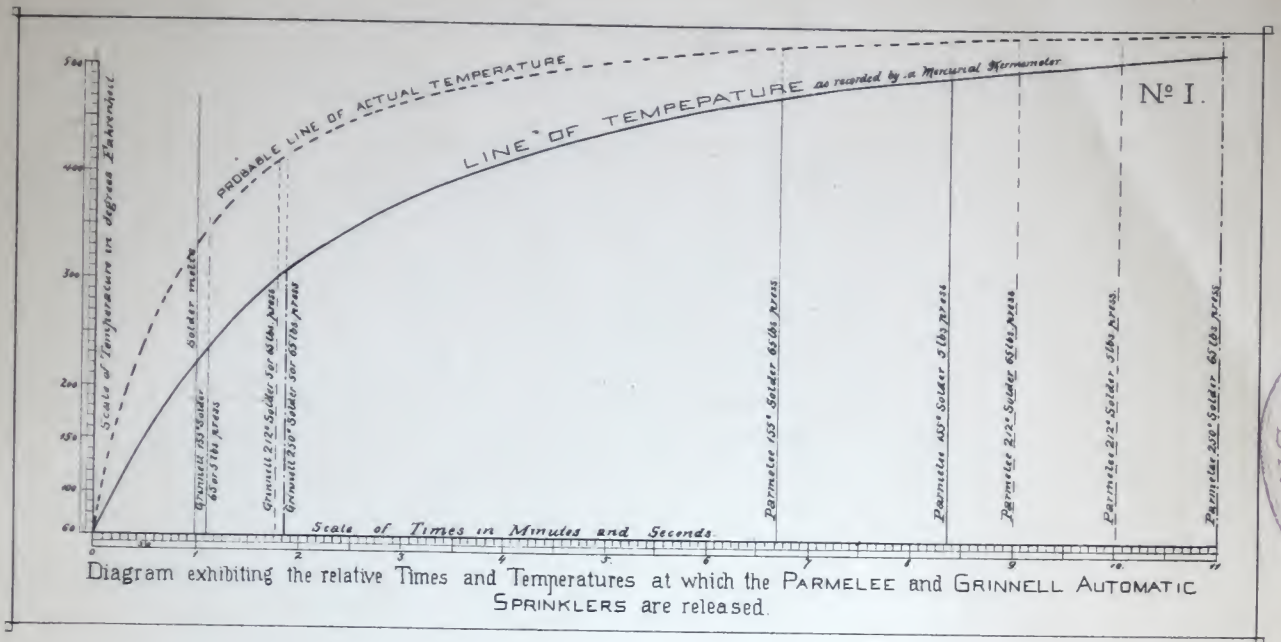
During the last four years we have been engaged in introducing and supplying the Parmelee Sprinkler with good success and to the general satisfaction of our patrons, as our numerous letters from them show; but while we were fully convinced that the automatic system, as a whole, to which we have applied these sprinklers, cannot well be improved, we are quite as thoroughly convinced that the sprinkler itself would be much more valuable if more sensitive to heat, and therefore more certain to act at an early stage of the fire.

The popular notion is that the heat must be very intense to melt the solder, — so intense, indeed, as to require a fire that might already have destroyed the contents of the room. We have often found it difficult to obtain favorable consideration for the Parmelee, even for small rooms, where the fire could not spread over much space, so great was the prejudice or the misapprehension concerning it. In a measure we ourselves have inclined to the opinion that in large rooms, with extra-combustible materials, the fire might possibly work ahead of the Parmelee Sprinkler; hence our efforts to produce a *new* sprinkler that should be more sensitive than the old one.

To this end Mr. Grinnell, the President of our Company, has been assiduously at work, with all the appliances of our large and well-equipped workshop, and sparing neither time, labor nor expense, in producing and experimenting with many forms and devices. We take much pride and pleasure in the final result of these efforts, — the new GRINNELL SPRINKLER. And while its chief merit is that it accomplishes the end sought, the claim may also be made for it that it does not call for novel or complicated forms or new materials: the whole device is within the range of well-understood and established practice of the workshop. The new sprinkler is, therefore, no untried experiment in mechanical construction, and we offer it to our patrons, not as a rival to the Parmelee, but as its legitimate substitute or successor.

SCIENTIFIC EXPERIMENTS INSTITUTED.

In order that the actual and relative sensitiveness of the two sprinklers, viz., the Grinnell and Parmelee, — the latter being a representative of *all* water-joint sprinklers, — might



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PRACTICAL CONCLUSIONS FROM THESE EXPERIMENTS.

Although we have already referred to the marked difference in time and temperature required to operate the Grinnell Sprinkler and the Parmelee, or any water-joint sprinkler, in our description of the same, yet we desire to impress the reader still more deeply with the vast importance of a quickly operating sprinkler, as to its value in preventing the spreading of even a small fire to more dangerous portions of the building than where the fire originated, for example, to an elevator-shaft, stair-ways, belt openings, etc. Rooms that are frequently thought to be absolutely safe against fire, so far as to places where it can originate without them, are yet set on fire by its being conveyed there through apertures that could conduct only a small amount of fire. A Grinnell Sensitive Sprinkler placed in such openings will prevent the fire extending beyond that point. A water-joint or slow-opening sprinkler would allow the fire to pass such a point; and this feature alone should give it preference over any other sprinkler.

In card-rooms and other places where there is a light but rapidly burning material, the Grinnell Sensitive Sprinkler alone can arrest the fire, and throw the water *ahead* of the fire, and thus limit its extent to the smallest practicable area.

In the first moments of danger a single pail of water will extinguish the fire; and herein is the great merit of the Automatic Sprinkler. *It is that pail of water, and it promptly applies itself.*

We desire to emphasize these proved facts: that the Grinnell Sprinkler will spread the water over a larger area than it is possible for a fire, under almost any conceivable circumstances, to cover before it had set the sprinkler in operation; and that by limiting the fire to this small area, in addition to other advantages mentioned, very delicate machinery is more likely to be saved from injury than when subjected to the greater heat resulting from the greater body of fire required to operate less sensitive and tardier sprinklers.

Practical Fire Tests.

Besides the scientific experiments made, we have also subjected the new Grinnell Sensitive Automatic Sprinkler to the same practical tests that have been employed to demonstrate the action of the Parmelee. In our own test building we have shown, and are always ready to show, in the presence of parties practically interested in the subject, the rapid action of the Grinnell Sensitive Sprinkler, and its superiority over every other.

Tests were also made at Chelsea, Mass., May 4, 1882, at the request of Mr. Edward Atkinson, President of the Boston Manufacturers Mutual Fire Insurance Company, the results of which are given in the following official report by Mr. Woodbury, the Inspector of the company:—

OFFICIAL REPORT OF A FIRE TEST.

BOSTON, May 5, 1882.

EDWARD ATKINSON, Esq., *President*:—

Sir,—The following is the report of experiments made upon certain automatic sprinklers, in the testing building at Chelsea, on the afternoon of May 4.

The portion of the testing building where the trials were made, measures twenty by thirty feet, and about ten feet high at the sides, and eleven and one-half in the middle.

The object of these experiments was not merely to estimate the absolute interval of time required for the operation of these sprinklers, but also to ascertain the relative time between any two sprinklers in comparison with the melting of a link of fusible alloy as a standard.

There were two sets of pipes near the ceiling, each for one set of sprinklers, and connected with the city water works, which furnished a supply under a head of about fifty-five pounds to the square inch. There were six heads of each kind of sprinklers, and also small bells hung close to the ceiling, near these heads, upon wires looped up with links of fusible alloy. Each group of sprinklers and bell was numbered from one to six, as shown on the sketch. The notes were taken by Mr. A. F. Nagle, and the various times given by the writer. The weather was clear; wind, a brisk westerly breeze. The doors and shutters of the room, except the door communicating to the other portion of the building, were closed.

First Trial.

A trail of fuel, consisting of three barrels of hand-planed pine shavings and one bundle pine "edgings," was laid along the middle of the room, forming a drift about twenty feet long two feet wide, and one foot high; the limits being about five feet from the ends of the room.

The Parmelee sprinklers were attached to one system of pipes and the Grinnell sprinklers to the other. Water was admitted to the Parmelee sprinklers only.

TIMES OF OPERATION.

Position.	Link of Fusible Alloy.		Grinnell Sprinkler.		Position.	Link of Fusible Alloy.		Grinnell Sprinkler.		Parmelee Sprinkler.	
	Min.	Sec.	Min.	Sec.		Min.	Sec.	Min.	Sec.	Min.	Sec.
1		34½	1	27	4		2				
2		37½	1	30	5		1 3	2	20		
3		39¾	1	52	6		1 11	2	25		

The shavings were lighted at the further end, and the fire burned along the trail about four feet by the time all the Grinnell sprinklers had opened, and Mr. Grinnell walked around the fire; but everybody was driven from the room by the heat before the Parmelee sprinkler opened and put out the fire.

Second Trial.

Fuel and other arrangements as before, except that the new Burritt Sprinkler was substituted for the Parmelee.

TIMES OF OPERATION.

Position.	Link of Fusible Alloy.		Grinnell Sprinkler.		New Burritt Sprinkler.		Position.	Link of Fusible Alloy.		Grinnell Sprinkler.		New Burritt Sprinkler.	
	Min.	Sec.	Min.	Sec.	Min.	Sec.		Min.	Sec.	Min.	Sec.	Min.	Sec.
1		47	1	43	3	17	4		52	3			
2		34	1	30			5	1	19				
3	1	19	2	32			6	2	17	3	14		

The writer remained in the room during this trial,—sitting down during the later stages of the fire.

Third Trial.

The trail of fuel was about the same height and width, but only ten feet in length. Water let on the pipes carrying the Grinnell Sprinkler.

TIMES OF OPERATION.

Position.	Link of Fusible Alloy.		Grinnell Sprinkler.		Position.	Link of Fusible Alloy.		Grinnell Sprinkler.	
	Min.	Sec.	Min.	Sec.		Min.	Sec.	Min.	Sec.
1	2	30			4	2	45		
2	1	4			5				
3			1	15	6				

Several persons in the room were watching the fire, when the sprinkler opened before it was expected and met them.

Fourth Trial.

Mr. Atkinson wished to see the operation of the Grinnell Sprinklers with a "hot fire," and four barrels of shavings were thrown up in a cone-shaped pile, about three and one-half feet high, in the middle of the room. This was lighted in six places near the base.

TIMES OF OPERATION.

Position.	Link of Fusible Alloy.		Grinnell Sprinkler.		Position.	Link of Fusible Alloy.		Grinnell Sprinkler.	
	Min.	Sec.	Min.	Sec.		Min.	Sec.	Min.	Sec.
1					4		23		
2					5		24		
3		21		36	6		29		

(And then 4 heads opened in 3 seconds later, and the separate time could not be taken.)

After the fire was put out, it was found that less than a bushel of shavings was burned, and that the request for a "hot fire" could not be granted, as there was nothing more combustible on the premises than dry pine shavings.

Respectfully,

C. J. H. WOODBURY, *Inspector.*

NOTE. — Mr. Woodbury omits to state that in this test the sprinklers were placed in squares of ten feet, making each sprinkler cover an area of 100 square feet.

THE SMALL ROOM FAVORED THE WATER-JOINT SPRINKLER.

It should be borne in mind that these tests which Mr. Woodbury reports upon were conducted within a comparatively small building. This fact is of importance for practical consideration, in that the Grinnell Sprinkler shows not only its *absolute* quickness of action, but that the *relative* rapidity would be disclosed to a still greater degree over the water-joint sprinklers, if a larger room were used for the test. For the small amount of heat necessary to operate the Grinnell did not make the room at all uncomfortable to persons present; in fact, the fire could be encompassed by a few persons joining hands, yet the great amount of fire necessary to operate the water-joint sprinklers caused the small room (20' x 30') to be filled with such a dense smoke and intense heat, as to drive all out of the room, or, at least, compelled the more courageous ones to crouch close to the floor. Is it not apparent, then, that in a large room, where the heat is free to expand into a great space, the action of a water-joint sprinkler must be proportionately slower? We leave the answer to be given by the reader.

MR. ATKINSON PREFERS THE GRINNELL SPRINKLER.

In Special Report No. 10, Mr. Edward Atkinson, President of the Boston Manufacturers Mutual Fire Insurance Company, in speaking of Automatic Sprinklers, says: "The tests of this sprinkler (the Grinnell) have given great satisfaction, in respect to its certainty and quickness of operation, and it is hoped that it may meet all the theoretical conditions of safety; especially is it hoped, that, in a card or mule room, it may work in advance of the spread of a fire, which its extreme sensitiveness may give us reason to expect when it is exposed to such an actual trial."

"Although it is our custom to avoid creating a preference in respect to one apparatus over another, when we accept either, yet in such an important matter as this we feel bound to say that we prefer the Grinnell Sensitive Sprinkler to any other yet offered."

Conclusion.

We have endeavored to explain the object of the Automatic Sprinkler in such manner as to leave no question, in the mind of any property-owner, that it is the only rational method of dealing with the fire problem. Our extensive experience in the construction of fire apparatus, and having been, during the last four years, the sole makers of the Parmelee, justly entitles us to claim eminent ability to know the requirements of an Automatic Sprinkler and its fitness for fulfilling those requirements.

We have brought the Parmelee to such stage of perfection as it is capable of, and it has served the valuable purpose of developing the automatic principle of extinguishing fire. In our regular course of business with the Parmelee, we have of late presented the merits of the Grinnell, and without exception it has been preferred by our patrons. As an evidence of their preference, we have on our books more than *seventy* orders from first-class concerns, requiring many thousands of sprinklers.

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May 18, 1882.



